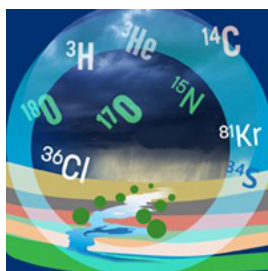


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Isotopes in the unsaturated zone: new opportunities and challenges

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Isotopes have been frequently used as tracers to study water flow and transport processes in the unsaturated zone. For example, they can give information about water transit times, groundwater recharge rates, evaporation rates or ecohydrological processes. In recent years, new analytical and technical developments have transformed the field of isotope hydrology and widened the scope of questions that can now be tackled. In particular, it is now possible to measure and parameterize isotope dynamics within the unsaturated zone at increasingly finer resolution. In addition, new sampling systems in combination with the new laser technologies can provide high-resolution and even in-situ measurements. In this talk, new possibilities of sampling and analyzing oxygen and hydrogen isotopes in pore water as well as challenges of these sampling and analytical methods are presented. The importance of isotopes and their contribution to advancing our understanding of water flow and transport processes in the unsaturated zone are highlighted, including different examples of using isotopes for numerical model calibration. Further, current challenges and future opportunities for including isotope approaches in solving open research questions in unsaturated zone hydrology are presented.

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